RELATIVE HUMIDITY.

December was generally drier than the average in the portions of the country to the eastward of the Great Plains, except over relatively small areas along the northern border, and in the central Gulf States. Over much of the Great Plains and Rocky Mountain regions, and the southern portion of the Pacific Coast States the relative humidity was above the average, elsewhere it was near the average.

GENERAL SUMMARY.

The first decade of the month was favorable for farm work, except in the extreme Northwestern States, but during the balance of the month field work was possible, as a rule, only in the more southern portions of the country, and dry and cold weather hindered plowing and seeding in those districts to some extent. Winter grains were well protected by snow during the greater part of the month in northern and northeastern districts, but in the Southwest cold weather did some injury to winter wheat, and the lack of precipitation was unfavorable for grain in Texas. There was considerable damage to the more tender truck crops by the cold weather of the middle and latter parts of the month in most Southern States and vegetation was unfavorably affected by dry weather in the Southwest. The unseasonably low temperature favored ice harvesting in the Northern States.

SEVERE LOCAL STORMS.

The following notes regarding severe storms have been extracted from the monthly reports of the several States.

Arkansas.—Moderate tornadoes were reported at Hardy and Stuttgart, Ark., on the 7th, by which 8 persons were injured and some property destroyed. A severe tornado, by which 17 persons were killed, a large number injured, and property valued at over $100,000 was destroyed, occurred on the 26th. It followed a nearly straight course from Leola, Grant County, Ark., to Des Arc, Prairie County, Ky., a distance of over 85 miles. The tornado was accompanied by heavy rainfall, extending to the eastern and northern borders of the State, 24-hour falls of from 3 to 5 inches occurring at a number of places. A slight tornado was also reported at Lake Village, Ky., on the 26th, in which one person was injured and some property destroyed.

Kentucky.—A tornado and hailstorm occurred in the vicinity of Calhoun, Ky., on the 4th. The course of the storm was nearly east. Two heavy hailstorms occurred, the first about 2:30 p. m., some of the hail being as large as partridge eggs, but irregular in shape, and the second about 3 p. m., with hailstones about one-fourth inch in diameter and almost perfectly round, which covered the ground. The tornado occurred during the first hailstorm and the funnel-shaped cloud seemed to come out of the southwest corner of the storm, about 3 miles south of Calhoun. The path of the tornado, as marked on the earth, varied between 7 and 300 yards in width, and was several miles in length. Several dwellings and a number of outbuildings were destroyed. No lives were lost, although there were several narrow escapes. A schoolhouse was completely destroyed, but the storm occurred during a recess period, when the pupils were on the playground, and they with the teacher sought shelter in a protecting cove, and thus escaped.

During a blinding snowstorm on the 22d, a residence near Danville, Ky., was struck by lightning and completely wrecked. The occupants were severely shocked.

Average accumulated departures for December, 1916.

Districts.	Temperature.			Precipitation.			Cloudiness.		Relative humidity.	
	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure from the normal.	General mean for the current month.	Departure from the normal.
	°F.	°F.	°F.	In.	In.	In.	0–10		P. ct.	
New England	28.8	−0.7	− 5.2	3.24	−0.10	− 4.90	5.7	−0.4	73	− 3
Middle Atlantic	34.8	−0.4	+ 7.2	3.51	+0.40	− 5.40	5.4	−0.4	69	− 6
South Atlantic	48.4	+1.3	+12.3	2.52	−1.10	−12.90	4.6	−0.3	73	− 5
Florida Peninsula	67.9	+2.0	+ 0.6	0.64	−1.40	−14.00	3.3	−1.4	79	− 3
East Gulf	50.7	+1.5	+10.4	4.90	+0.40	− 2.20	5.6	+0.1	77	0
West Gulf	49.8	+1.2	+14.4	1.13	−1.70	− 8.50	4.9	−0.3	69	+ 4
Ohio Valley and Tennessee	34.8	−1.8	+ 2.4	3.45	0.00	− 2.40	5.7	−0.6	73	− 3
Lower Lakes	27.1	−2.0	− 1.1	2.54	−0.40	− 3.70	7.4	−0.3	74	− 4
Upper Lakes	20.3	−4.1	− 1.6	2.16	+0.10	+ 2.00	6.4	−0.9	82	0
North Dakota	2.8	−9.0	−22.0	1.27	+0.60	+ 0.10	4.7	−0.7	85	+ 6
Upper Mississippi Valley	23.2	−4.1	+ 2.1	1.46	−0.30	− 1.90	5.2	−0.6	76	− 2
Missouri Valley	22.4	−4.5	+ 6.4	0.90	−0.20	− 6.00	4.8	−0.4	74	− 1
Northern slope	14.3	−9.4	−24.4	1.24	+0.40	+ 0.60	5.9	+0.7	74	+ 6
Middle slope	29.9	−3.0	+ 2.1	0.67	−0.10	− 4.00	4.3	+0.2	66	0
Southern slope	43.5	−1.0	+13.1	0.33	−0.50	− 5.20	3.3	−1.7	51	−15
Southern Plateau	38.4	−3.7	− 8.9	0.71	0.00	+ 1.00	2.9	−0.3	50	+ 7
Middle Plateau	26.8	−4.5	−14.6	0.89	−0.10	+ 0.50	5.4	+0.6	68	− 2
Northern Plateau	26.4	−5.6	−26.5	1.75	0.00	+ 0.70	7.8	+1.0	79	− 1
North Pacific	38.8	−3.4	−13.2	5.49	−2.20	−11.90	8.6	+0.8	87	+ 1
Middle Pacific	45.0	−3.6	− 9.4	4.41	0.00	− 1.80	5.1	−0.3	78	− 3
South Pacific	50.0	−3.0	− 9.2	4.00	+1.80	+ 6.60	4.6	+0.3	72	+ 3

WEATHER CONDITIONS ON THE NORTH ATLANTIC DURING DECEMBER, 1915.

The data presented are for December, 1915, and comparison and study of the same should be in connection with those appearing in the REVIEW for that month (cf. Chart III, Dec., 1915, XLIII–134). Chart IX (XLIV–153) shows for December, 1915, the averages of pressure, temperature, and the prevailing direction of the wind at 7 a. m., 75th meridian time (Greenwich mean noon), together with notes on the locations and courses of the more severe storms of the month.

PRESSURE.

The distribution of the average monthly pressure, as shown on Chart IX, presents few unusual features. The North Atlantic or Azores HIGH, with a crest of 30.15 inches, was practically normal as to position, extent, and intensity, while the continental HIGH was south of its usual position, the crest of 30.15 inches being central in southeastern Georgia.

A well-defined area of low pressure surrounded by an isobar of 29.5 inches, extended from the Irish coast to the thirty-seventh meridian, and from the fiftieth to the fifty-seventh parallel. The lowest average monthly pressure reading for any 5-degree square was 29.47 inches, and occurred in the square between latitude 50°–55° N. and longitudes 25°–30° W., where the lowest individual reading during the month was 28.60 inches, on the 30th, and the highest 30.22, on the 11th. The highest average monthly pressure was 30.16 inches, and occurred in the square that includes the Madeira Islands, where the daily readings ranged from 29.82 inches on the 27th, to 30.46 inches on the 13th. Over the eastern part of the ocean the gradients of mean monthly pressure between the upper and lower latitudes were somewhat steeper than usual, while over the western division they were practically normal.

The usual rapid winter pressure changes were in some cases very marked, and in one 5-degree square in the northeastern part of the ocean, the barometer rose from 28.70 inches, on the 8th, to 30.40 inches, on the 12th.

In this same locality the mean barometric readings for the first and last decades of the month were 29.26 inches and 29.21 inches, respectively, while for the middle period it was 30 inches. In the 5-degree square between latitude 40°–45°, longitude 35°–40°, the average for the first decade was 29.42 inches, the second 30 inches, and for the last 11 days, 29.72 inches.

In the waters adjacent to the American coast, between the fortieth and forty-fifth parallels, the averages are as follows: First decade, 29.97 inches; second decade, 29.83 inches; and for the last 11 days, 30.03 inches. In southern waters, the variation in pressure from day to day was, as usual, not large and the averages for the three decades of the month differed but slightly.

GALES.

December is usually one of the stormiest months of the year, and in December, 1915, the number of days on which gales were reported was considerably above the normal over the greater part of the ocean north of the thirty-fifth parallel, and in the territory between the thirtieth and thirty-fifth parallels, west of the Bermudas. The greatest number of gales reported from any 5-degree square was 11, a percentage of 35, and occurred in the square between latitudes 35°–40°, longitudes 60°–65°, where the normal percentage is 19. Along the American coast between Hatteras and Halifax, they were reported on from 7 to 9 days, which was considerably above the normal.

On December 1, 1915, a well-developed area of low pressure (1 on Chart IX) was central near latitude 43, longitude 30. On the same date a second LOW had its center about 200 miles southeast of Halifax, and a third surrounded Ireland with the isobar of 29.1 inches extending as far east as Liverpool. One vessel near the Scilly Islands, and another a short distance southeast of Brest, France, reported westerly and northwesterly gales of 48 and 54 miles, respectively, while no winds of gale force were reported from the vicinity of the other two depressions. On December 2, the first disturbance (LOW 1) was central near latitude 48°, longitude 24°, and while the barometer had fallen to 29.10 inches, only moderate winds prevailed; the second LOW had disappeared; the third was central somewhere in the North Sea, although it was impossible to plot its position accurately on account of lack of observations. During the next 24 hours LOW 1 moved a short distance in a northeasterly direction, and the extent of its area had contracted to a marked degree; the lowest barometer reading had fallen to 28.93 inches, and 3 vessels near the center reported westerly gales of from 40 to 50 miles. The course of this disturbance then assumed an easterly direction, and on the 4th the center was near latitude 50°, longitude 17°, where moderate winds prevailed. It then curved toward the northeast, and on the 5th was near the west coast of Ireland, the winds remaining moderate in force and the barometer changing but little. On this date a second LOW was central near latitude 41°, longitude 49°; a number of vessels encountered moderate to strong gales, and the storm area covered a narrow belt between the forty-fifth meridian and the American coast. During the next 24 hours the northerly movement of LOW 1 was slight, while its intensity increased, as the barometer had fallen to 28.81 inches on the 6th, and two vessels reported unusually heavy gales of 75 and 90 miles an hour, respectively. By this time the second LOW had moved to about 5 degrees due east of its position on the 5th, and the conditions of wind and weather remained practically the same, as moderate gales were reported in the west southwest quadrants. Continuing with a nearly uniform rate of speed and direction, LOW 1 was central on the 7th near Stornaway, Scotland, where the barometer had fallen to 28.70 inches, and heavy gales prevailed between that point and the twentieth meridian. The second LOW remained practically stationary and the storm area was somewhat larger than on the previous day, with a falling barometer. The course of LOW 1 then curved toward the east and on the 8th the area of low pressure covered the western part of the Scandinavian peninsula; the pressure was somewhat higher than on the 7th, although strong gales still existed between the fifth and thirteenth meridians, west longitude. The second LOW had moved rapidly in a northeasterly direction, and on the 8th the center was near latitude 47°, longitude 33°; the storm area had contracted somewhat in area, although northeasterly gales accompanied by hail were reported between the thirty-seventh and forty-seventh meridians. This storm then turned toward the north, increasing in intensity all the time, and on the 9th the center was near latitude 53°, longitude 30°; the barometer now read 28.60 inches, and the maximum wind velocity ranged from 60 to 75 miles an hour.

On December 9 a LOW (II on Chart IX) of limited extent was central near latitude 43° N., longitude 66° W., and northeasterly gales extended as far south as the thirtieth parallel in the vicinity of the American coast, and hail was reported by one vessel. By the 10th this disturbance had moved about 10 degrees due east of its position on the 9th, increasing somewhat in intensity and extent; a number of vessels encountered violent southerly gales between the forty-seventh and fifty-first meridians, while heavy northwesterly winds, accompanied by hail and snow again prevailed along the American coast between Boston and Hatteras.

On December 11 this disturbance was in the vicinity of Saint Johns, Newfoundland, where the barometer read 28.68 inches; fog was reported by two vessels about 5 degrees southeast of that point, although heavy southeasterly gales prevailed between the fortieth and fiftieth parallels and the thirty-fifth and fortieth meridians, and northwest winds of nearly as high velocity were encountered in the southwest quadrant between the thirty-fifth and forty-fifth parallels, west of the sixtieth meridian. By the 12th the LOW had moved to a position near latitude 50°, longitude 47°. Two narrow belts of heavy winds extended from the center of this disturbance; the first toward the southwest to a point about 5 degrees east of Halifax, and the second due east to the thirtieth meridian, while in the territory between the two belts, moderate southwest winds prevailed. This storm continued in a northeasterly direction, and on the 13th the center was apparently near latitude 56°, longitude 34°, where two ships recorded westerly gales of 50 miles an hour, the storm area extending as far south as the forty-eighth parallel.

On December 13 a second LOW (III on Chart IX) was central 3 degrees east of Norfolk; it was of small area and light intensity, with moderate winds. This LOW moved rapidly, and on the 14th occupied the region between Halifax and Boston, the center being near Portland, while westerly gales of from 40 to 55 miles an hour occurred in a narrow strip along the coast as far south as Hatteras. On the 15th Halifax was the center of the depression, and the storm area was almost the same in extent as on the day before, while snow was reported by two vessels in the southwest quadrant. On the 16th and 17th this disturbance was near St. Johns, Newfoundland, and the wind had moderated considerably since the 15th, while

snow and hail were reported by one vessel on the 16th, and snow on the 17th.

On December 19 a well-developed depression covered Newfoundland; a number of vessels between the fortieth and forty-fifth parallels reported strong westerly gales, although in the waters adjacent to the American coast the winds were from light to moderate. This LOW moved slowly in an easterly direction, and on the 25th was central over Ireland. The track of this disturbance was so far north that it was impossible to locate the position of its center due to lack of reports, until the 24th, when it was near latitude 55° N., longitude 14° W. On the 22d and 23d moderate to very heavy gales prevailed along the greater part of the northern steamer tracks and one vessel on the 22d, near latitude 45°, longitude 47°, reported a southwesterly hurricane of 90 miles an hour, although 65 miles was the highest velocity recorded by any other vessel in the vicinity. On the 24th high winds prevailed over a large territory between the fortieth and fiftieth parallels, and the tenth and fortieth meridians, while one vessel encountered fog in the Irish Channel. On the 25th there were a few scattering reports of gales in the eastern part of the ocean, although for the most part the winds were of moderate force with considerable rain and snow between the twenty-fifth and fortieth meridians. On the 26th, Boston, with a pressure reading of 28.92 inches, was the center of a severe disturbance; two vessels about 2 degrees south of the center encountered southwest winds of 75 miles an hour, while winds of gale force covered a narrow strip extending as far south as the thirty-fourth parallel, and as far east as the sixty-second meridian. On the 27th this disturbance was central near St. Johns, Newfoundland, and while the maximum velocity of the wind was not as high as on the day before, moderate to strong gales still prevailed in the southerly quadrants. On the same day a second LOW covered the southern part of Ireland, extending to the west coast of England. Two vessels about 3 degrees south of the center reported westerly gales of 75 miles an hour, and scattering reports indicated that winds of gale force existed as far south as the Azores. On December 28 the first LOW was near latitude 55°, longitude 40°, having changed but little in intensity, although the storm area had contracted somewhat since the previous day. The second LOW was probably near Denmark, although it was impossible to locate it accurately on account of lack of observations.

On December 30 a restricted area of low pressure was central near latitude 43°, longitude 56°; northeasterly gales with a maximum force of 55 miles an hour occurred near the center, accompanied by hail and snow. On this date a second LOW was in the vicinity of latitude 52°, longitude 27°. This was much more extensive than the first, and while the highest force of the wind was about the same as on the day before, the storm area extended from the forty-second to the fifty-second parallels, and from the twentieth to the forty-second meridians. On December 31 these two depressions had evidently combined, as on that date only one area of low pressure existed, and that covered a large territory from the west coast of Ireland to the fortieth meridian, and from the forty-fifth to the sixtieth parallels. The storm area was not as large as on the previous day, and a number of observations showing winds of moderate velocity were interspersed with those of gale force.

TEMPERATURE.

The mean monthly temperature of the air over the ocean, was, as a whole, somewhat above the normal, although there were small negative departures in the region between the forty-fifth and fiftieth parallels, and the fifteenth and twenty-fifth meridians. In the waters adjacent to the American coast, temperatures were considerably above the normal north of the fortieth parallel, while they decreased toward the south, reaching the minimum at Hatteras, where the departure was −4.1 degrees. The temperature increased gradually from the thirty-fifth parallel southward along the Florida coast, and in the Gulf of Mexico the departures ranged from +1 to +4 degrees.

The temperature departures at a number of Canadian and United States Weather Bureau stations on the Atlantic and Gulf coasts were as follows:

	°F.		°F.
St. Johns, N. F.	+4.1	Norfolk, Va.	−2.5
Sydney, C. B. I.	+5.0	Hatteras, N. C.	−4.0
Halifax, N. S.	+4.5	Charleston, S. C.	−3.1
Eastport, Me.	+4.3	Key West, Fla.	−1.7
Portland, Me.	+2.3	Tampa, Fla.	−1.1
Boston, Mass.	+2.6	Pensacola, Fla.	+0.9
Nantucket, Mass.	−1.1	New Orleans, La.	+2.3
Block Island, R. I.	−1.6	Galveston, Tex.	+1.6
New York, N. Y.	−0.9	Corpus Christi, Tex.	+4.6

FOG.

There was considerably less fog than usual during December 1915. Off the banks of Newfoundland the normal percentage of days with fog is from 30 to 35, while in the same region during December, 1915, it was reported on three days, a percentage of 10. Over the western part of the sailing routes fog was reported on from one to two days, while the eastern portion was practically free.

PRECIPITATION.

The largest number of days on which hail was observed in any one 5-degree square, was four, between latitude 45°–50°, and longitude 35°–40°; while snow was reported on five days in the square that includes Halifax, Nova Scotia. The eastern part of the North Atlantic was comparatively free from hail and snow, and south of the thirty-fifth parallel, hail alone was reported on one day.

Maximum wind velocities during December, 1916.

[Velocities below 50 mi./hr. (22.4 m./sec.) are not included.]

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Mi./hr.				*Mi./hr.*	
Block Island, R. I.	6	56	nw.	Nantucket, Mass.	15	59	ne.
Do.	7	60	nw.	Do.	16	50	nw.
Do.	12	58	w.	Do.	22	61	w.
Do.	13	54	w.	Do.	23	60	w.
Do.	15	56	nw.	New York, N. Y.	6	72	nw.
Do.	16	70	nw.	Do.	7	54	nw.
Do.	22	72	w.	Do.	12	52	sw.
Do.	23	60	w.	Do.	16	57	nw.
Buffalo, N. Y.	1	64	w.	Do.	22	88	nw.
Do.	5	68	w.	Do.	23	54	nw.
Do.	6	64	w.	Do.	25	58	nw.
Do.	9	74	sw.	Norfolk, Va.	16	60	nw.
Do.	10	52	w.	Do.	22	74	w.
Do.	14	56	sw.	North Head, Wash.	3	96	se.
Do.	24	56	sw.	Do.	7	62	se.
Do.	25	52	w.	Do.	31	58	se.
Burlington, Vt.	27	52	s.	Point Reyes Light,			
Cheyenne, Wyo.	3	60	w.	Cal.	1	61	s.
Do.	4	56	w.	Do.	2	72	s.
Do.	14	57	w.	Do.	3	52	s.
Do.	15	64	w.	Do.	5	66	nw.
Do.	16	54	w.	Do.	6	59	nw.
Do.	18	65	w.	Do.	19	54	nw.
Do.	19	64	w.	Do.	20	58	nw.
Do.	31	52	w.	Do.	23	65	sw.
Columbus, Ohio.	8	50	w.	Do.	24	65	nw.
Eastport, Me.	16	77	ne.	Do.	25	61	nw.
El Paso, Tex.	25	52	sw.	D.	27	56	se.
Grand Forks, N. Dak.	15	62	nw.	Providence, R. I.	6	54	w.
Hatteras, N. C.	16	53	nw.	Do.	16	54	nw.
Jacksonville, Fla.	12	54	sw.	Do.	22	71	w.
Mt. Tamalpais, Cal.	2	52	sw.	Do.	23	82	w.
Do.	3	56	sw.	St. Paul, Minn.	15	52	nw.
Do.	5	62	nw.	Do.	26	50	se.
Do.	6	57	nw.	Sandy Hook, N. J.	16	50	w.
Do.	19	72	nw.	Do.	22	65	nw.
Do.	20	74	nw.	Sault Ste. Marie,			
Do.	23	60	sw.	Mich.	5	52	nw.
Do.	24	63	sw.	Syracuse, N. Y.	6	58	nw.
Do.	25	60	nw.	Trenton, N. J.	22	54	nw.